



NOAA FISHERIES

Southwest Fisheries Science Center

Response to the External Review of Data and Information Used in Fishery Stock Assessments July 29-August 1, 2013 La Jolla, California

The following provides an overview the Southwest Fisheries Science Center's 2013 *Data and Information Used in Fishery Stock Assessments* external review and a response to the Panel reports. The reports and additional review material, including presentations, can be found here: <http://swfsc.noaa.gov/2013DataManagementReview/>

BACKGROUND

In January of 2013, NOAA Fisheries initiated a standardized five-year cycle to peer review science conducted by each of the six science centers and the headquarters Office of Science and Technology. Each year a specific national theme is to be emphasized. This year the focus was on data and information collected and compiled for fishery stock assessments under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). We invited experts from both inside and outside the federal government to evaluate our approach to the information used in assessments of highly migratory and coastal pelagic species. Data for groundfish species were reviewed in conjunction with the Northwest Fisheries Science Center (NWFSC) review in September 2013, and salmon data will be reviewed in 2015 when protected species science is considered. We welcomed this opportunity to illustrate the steps we have taken to collect and use such information and to receive guidance on improving our data systems to offer the greatest utility and transparency possible.

Panel

The Southwest Fisheries Science Center (SWFSC; hereafter the Center) review was held July 29-August 1, 2013, in La Jolla, CA. The review panelists were members of the scientific community with expertise in the areas reviewed:

- Dr. Donna Schroeder, Chair, Bureau of Ocean Energy Management
- Dr. Rick Deriso, Inter-American Tropical Tuna Commission
- Dr. Larry Jacobson, NOAA Northeast Fisheries Science Center
- Dr. Sam Pooley, NOAA Pacific Islands Fisheries Science Center
- Dr. Chris Sabine, NOAA Pacific Marine Environmental Laboratory

Focus: Within broad national Terms of Reference, the review focused on data used in a representative coastal pelagic species (CPS) stock assessment, Pacific sardine, as well as three representative highly migratory species (HMS) stock assessments: north Pacific albacore,

swordfish and blue sharks. Much of the data used in our HMS stock assessments are fishery data, i.e., information collected from logbooks and landing receipts. CPS stock assessments rely heavily on both fishery-dependent and survey (fishery-independent) data. We provided background information on all data sources as well as the role of habitat and oceanographic data during the review.

Fishery stock assessments at the Center are conducted both in-house as well as through collaborative international working groups. For example, our international assessments for HMS (tunas, billfish, etc.) are conducted through the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC). Additional information for HMS stock assessments is provided by our colleagues at the Pacific Island Fisheries Science Center (PIFSC) in Honolulu, HI and at the Inter-American Tropical Tuna Commission (IATTC) in La Jolla. To prevent overlap the PIFSC, NWFSC and SWFSC operate under a series of signed operating agreements (7/2010) that designate lead and supporting roles for Centers in different assessment activities. Within the Pacific Fishery Management Council (PFMC) there are four fishery management plans (FMPs) as well as a developing Ecosystem FMP. The SWFSC is the lead for PFMC assessments within the CPS FMP and the HMS FMP, and we provide formal scientific input for their management in collaboration with partners. We collaborate extensively with partners to provide fishery information to the PFMC and the West Coast Regional Office (WCRO). We also provide data and advice in support of the Department of State for the U.S.-Canada Albacore Treaty and other treaty obligations.

The objective of the review was to determine if the Center is collecting the right types and amounts of information for fishery assessments, and to learn how we can improve the collection and compilation of this information. We asked the Panel to provide their insights on the following questions:

- Relationship of current and planned fishery assessment data activities to Center fishery assessments mandates and requirements – is the Center doing the right things?
- Opportunities – are there opportunities that the Center should be pursuing in collecting and compiling fishery assessment data, including shared approaches with partners?
- Scientific/technical approach – are the Center’s fishery data objectives adequate, and is the Center using the best suite of techniques and approaches to meet those objectives?
- Organization and priorities – is the Center’s fishery data system properly organized to meet its mandates and is the allocation of resources among program appropriate?
- Scientific conduct – are the Center’s fishery data programs being conducted properly (survey design, standardization, integrity, peer review, transparency, confidentiality, PII, etc.)?

Acknowledgments

The members of the Panel prepared individual reports based on their observations during the three days of this review. We are grateful to the panelists for participating in the four days of the review, as well as the pre-review study of the materials and the post-review analyses and deliberations. We sincerely appreciate their efforts and candor in assessing our data programs. We also thank the involvement of our partners and stakeholders, as well as all of our staff who prepared and presented material for this review.

PANEL OBSERVATIONS

The Panel's review established benchmark standards and associated numerical scores (on a scale of 3 through 1) to assess the Center's program goals and objectives:

(3) *Exceeds expectations*: Science program consistently does more than expected for the major areas of responsibility for data collection to support stock assessment activities outlined by the MSA, and conclusion is supported by several objective examples going beyond requirements and standards.

(2) *Meets expectations*: Science program consistently meets expectations for the specific mandates outlined by MSA. The program consistently and fully satisfied the high performance expectations of a NOAA Fishery Science Center for the major areas of responsibility for data collection regarding impact, timeliness, cost effectiveness, client satisfaction, accuracy, consistency, etc., to support stock assessment activities outlined by the MSA.

(1) *Needs improvement*: Science program did not consistently meet performance expectations.

In general, the Panel concluded that the Center met or exceeded expectations for our research programs¹ with the exception of the fourth question (see page 2 above) concerning "Organization and priorities". The Panel stated that staff vacancies in data management have inhibited success in CPS and HMS programs. The Panel considered the issues related to data management should be among the Center's highest priority challenges to address.

The Panel also expressed that the Center's scientific and technical approaches and scientific conduct were commendable and particular strengths of the approaches include innovation, long-term data streams, surveys, efficiency of data collection, and scientific integrity. They agreed on the high degree of professionalism, expertise, and dedication of all Center personnel despite facing challenging workload assignments and budget limitations.

The Panel noted that the Center is known for its innovative advancements in science and technologies to improve our understanding of stock productivity and the accuracy and precision of stock assessments. The Panel felt that the advancements pursued as part of the Center's culture are critical for meeting the increasing demands for more information on MSA species and should be encouraged. In particular, the acoustics and ichthyoplankton efforts being developed have great potential to provide information on multiple CPS and potentially HMS. The Panel felt that the CPS surveys were innovative, well designed, well run and appropriate to meet the science objectives. The Panel acknowledged the difficulties in developing statistically valid fisheries independent survey approaches but noted and encouraged the innovative contributions of the HMS survey and biological sampling program to better resolve life history parameters such as size at age and the use of electronic tagging and genetics to resolve stock structure.

The Panel noted that the CalCOFI surveys (California Cooperative Oceanic Fisheries Investigations, <http://www.calcofi.org>), one the "crown jewels" of the Center's long-term data streams², collect an exceptional amount of biological and oceanographic data useful to a wide array of management and scientific needs and that they are among the best in the world for the general survey of the ecology on coastal species.

¹ See Table 1 in <http://swfsc.noaa.gov/2013DataManagementReview/> Summary Report.

² Two other of the SWFSC's long-term data streams include those of our Antarctic and our Eastern Tropical Pacific Research Programs.

The Panel provided extensive valuable suggestions for improvements, which we group into four themes in our response below:

- **Data management planning**
- **Addressing data management vacancies**
- **Workload priorities**
- **Partner collaborations**

Reviewers noted that with decreasing Agency resources and increasing pressure for more fisheries information, it is becoming more important to plan strategically and that setting priorities and filling vacancies should be done concurrently. The Center's Strategic Science Plan³ was provided to the Panel prior to the review and will be used as we address the Panel's recommendations as outlined below.

RECOMMENDATIONS AND RESPONSES

Data management planning

Recommendation: Modernize existing databases. Reviewers noted that data management is a central National Marine Fisheries Service (NMFS) function and a product with enduring scientific and practical value. Data collections are major scientific assets for the Nation and they need to be safeguarded accordingly; scientists and the public should have user-friendly access to the data.

Response: Data managed by the Center are archived in several different ways using a wide variety of technologies (e.g., Excel, Access, Oracle, SQL server, etc.). In some cases, individual Principal Investigators (PIs) house fishery-independent research data on their desktop computers with little or no documentation. Inconsistent formats and insufficient technical knowledge limit PIs' abilities to meet data requests and data cannot be served easily to end users, including the public. Reviewers recommended developing a strategic "Information Management Plan" for reorganizing the data management system, perhaps in consultation with data management experts from other science organizations. NMFS has already recognized this need agency wide and has issued policy directive *PD 04-111 Data and Information Management*⁴ in an effort to improve agency efforts in adequately managing and serving information collected and managed by agency staff. The Center acknowledges the recommendations made by reviewers on features that should be incorporated in any data management scheme to safeguard data and ensure quality control including the need for validation rules, protocols and documentation.

Action items:

- The Center has started implementing a relatively comprehensive plan for migrating all the HMS fishery data to a centralized NMFS Oracle database. Progress has been slowed due to the loss of Oracle database specialists at the Center and because tending to the routine reporting requirements to meet reporting obligations is a priority. The Oracle

³ <http://swfsc.noaa.gov/uploadedFiles/Home/SWFSCStratSciencePlan-2013.pdf>

⁴ <http://www.nmfs.noaa.gov/op/pds/documents/04/04-111.pdf>

database will initially house only the U.S. Pacific HMS fishery data that the Center manages.

- During FY14, the Center will evaluate the utility of consolidating and centralizing the HMS fishery-independent data. This will include consulting with outside organizations regarding the costs vs. benefits to centralizing data management.
- The Center just completed transferring the CalCOFI data from servers at the University of California San Diego, Scripps Institution of Oceanography to the SWFSC Environmental Research Division Data Access Program (ERDDAP) that is fully available to researchers and the public. Starting in 2014, we will begin adding the acoustic and trawl data from historic and current surveys to provide maximum access to these integrated observations.
- The Center will also continue to improve the quality and accessibility of fishery-dependent data through sponsorship and participation in the annual CalCOFI meetings, the Tri-national Sardine Forum, the U.S.-Mexico Bilateral meetings, the ISC, and the annual Tuna Conference that is jointly sponsored by the IATTC and NMFS now in its 65th year. The Center uses these venues to validate, coordinate and clarify data and to set up processes for data exchange.

User-friendly access to fisheries CPS data can be complex. Fisheries data used in CPS stock assessments are acquired from three countries, three state agencies and regional entities, such as the Pacific States Marine Fisheries Commission (PSMFC). Similarly, data used in HMS assessments come from up to 7 or more countries – all of which have different data acquisition and management protocols. While Center stock assessment scientists need these various data, we are not generally in a position to affect how or if the data are publicly available.

In addition, the Center agrees with two specific points raised in the review on HMS data:

- If resources permit, the Billfish Angler Survey⁵ and Tagging Program data will be migrated to an online system to which anglers can enter data directly; and
- The Center will evaluate during FY14 whether the western and central Pacific Ocean (WCPO) purse seine fishery data management would be more appropriately managed by the Pacific Island Regional Office (PIRO). The SWFSC has already initiated discussion with leaders at the PIRO and PIFSC who are the primary users of the data and the ones who oversee the data collection in the field.

Addressing data management vacancies

Recommendation: Hire additional staff for both the HMS and CPS programs specifically in QA/QC, database design, data extraction and statistics (HMS).

Response: the Center has several data management vacancies, especially in HMS, that have not been backfilled. We acknowledge that, as a result, our assessment scientists have a significant

⁵ The Billfish Angler Survey provides a valuable 40+ year index of fishing success in many areas of the Pacific and is another example of the Center's long-term data streams.

amount of data-management related challenges and many HMS and CPS databases have, for the most part, not been modernized. While many data sources are housed externally in State and foreign agencies, there are universal needs to extract, error check and prepare data for statutory reporting requirements and for use by assessment scientists.

Action item:

- Devoting staff resources to data management is a high priority for the Center. New restructuring and staffing during FY14-15 will decide whether to house all data managers in a common group with common and documented data management and data extraction protocols.

Workload priorities

As the Panel noted, an ideal program that satisfies data collection requirements for all information needs would quickly outstrip available staff time and program funding. Because of this, the Panel felt that additional strategic guidance would be beneficial in prioritizing goals and objectives for both CPS and HMS programs.

CPS Recommendation: Examine whether the frequency of CPS assessments is optimal and develop an adaptive plan for providing the data to conduct the proper suite of CPS assessments on an appropriate schedule.

Response: Center CPS assessment staff recently proposed an adaptive CPS assessment schedule⁶ to the PFMC that would reduce the number of full assessments conducted annually and thereby allow more stocks to be assessed. The arrival of the *R/V Reuben Lasker* on the West Coast in Spring 2014 and the new Ocean Technology Development Tank⁷ at the SWFSC's La Jolla Laboratory will greatly enhance the Center's overall survey capacity and ability to develop new surveys to collect data for the CPS assemblage.

Action items:

- The Panel supported the proposal for the adaptive CPS assessment schedule and the Center will continue working with the PFMC to prioritize assessments and enhance the number of stocks assessed. Results from similar emerging activities at other agencies, such as Canada's Technical Expertise Stock Assessment Program⁸, will be considered.
- We will develop an adaptive plan for determining what data collections would best address the proposed revised CPS assessment schedule that incorporates the new West Coast-based *R/V Lasker* and the Ocean Technology Development Tank.
- We will consider establishing a standing body including leadership of the SW and NW Fisheries Science Centers, the West Coast Region, the PFMC, and the PSMFC to discuss strategic priorities on a yearly basis.

⁶ http://www.pcouncil.org/wp-content/uploads/E1c_SUP_FSC_PPT_NOV2013BB.pdf

⁷ <http://swfsc.noaa.gov/textblock.aspx?id=16022&ParentMenuId=630>

⁸ http://www.dfo-mpo.gc.ca/csas-sccs/Schedule-Horraire/2013/10_29-31-eng.html

Included in this plan will be the following advancements that will support stock identification and thus stock assessments of multiple CPS:

- Develop protocols to use the *R/V Reuben Lasker*'s scientific scanning sonar to study the diel schooling behaviors of various CPS species and potential reactions that could hamper accurate identification/estimation by the survey gear; adding optical and acoustic sensors to the vessel's trawl nets; and developing towed optical devices to better investigate any biases (e.g., catchability and selectivity) of the trawl sampling of multiple species.
- Better define the frequency-dependent target strengths of animals of various species, sizes, and orientations, and the volume-backscatter spectra for schools of CPS with mixed-species or differing packing densities.

Reviewers offered different suggestions to consider in defining the scope of the HMS program and prioritizing monitoring, assessments and other responsibilities.

HMS Recommendation: Prioritize the HMS program's scientific responsibilities. The nature of migratory species requires staff to work intensively with many other countries and management organizations. There was concern that the HMS staff may be overcommitted in trying to meet ecosystem mandates and address more scientific studies at the expense of adequately maintaining the time-series data needed for assessments. There was also a sense that the Center needs to better prioritize HMS data management and that the HMS data group is rather isolated.

Response: The Center's recently completed Strategic Science Plan will underpin a Center-wide prioritization process that will be developing over the coming year and refined in subsequent years. Additionally, the Center has developed strong collaborations with international scientists who have greater access to data and samples across the species' ranges. In the case of HMS, the reviewers noted that international assessment activities and RFMO participation is particularly important given the treaty obligations and the role of the U.S. in establishing and enforcing conservation and management objectives.

Action items:

- The Center leadership will work with its Division Directors and Task Leaders to refine the Strategic Science Plan so that priorities are clear, and to ensure that program goals are consistent with those priorities. This could include utilizing data management expertise within the Center in order to take advantage of potential synergies across divisions or restructuring programs so that they better address established priorities.

Partner collaborations

Recommendation: continue the extensive and existing collaborations with the Pacific Islands Fisheries Science Center (PIFSC) and enhance collaborations with Mexico, California Department of Fish and Wildlife (CDFW), and the fishing community.

Response: The Center recently held two workshops to enhance cooperation with the U.S. CPS fishing industry. The workshops provided Center, other Federal and State scientists and the CPS fishing industry representatives the opportunity to better understand data needs and limitations and consider collaborations. In addition, Mexico (INAPESCA) will soon acquire a new fisheries

research vessel capable of acoustic and trawl sampling, and plan to use it to survey CPS off the west coast of Baja California. The Center has been actively communicating with INAPESCA via the U.S.-Mexico bilateral meetings and Tri-national Sardine Forum to encourage and enhance research collaborations regarding assessment of trans-boundary CPS resources.

Action items:

- Center staff will continue to participate in annual CalCOFI meetings, TriNational Sardine Forums and the U.S.-Mexico Bilateral meetings to enhance collaboration and encourage active exchanges of data and information between Mexico and Center scientists. The Center encourages greater participation of the PIFSC in the annual Tuna Conference and will consider ways to use the meeting for better coordination between Centers including co-hosting of the meeting.
- The Center will share CPS survey methods and information with colleagues from Mexico and potentially, conduct joint CPS surveys beginning in 2014.
- The Center will continue to build ongoing relationships with research colleagues in Norway in the development of acoustic capabilities. Visits have already taken place to test instrumentation in our Ocean Technology Development Tank and additional visits are planned for 2014.
- The Center will continue to work with fishing partners, the PFMC, and international partners to develop surveys that optimize data collections needed to address CPS management priorities. The Center will pursue more effective use of the HMS fishing community, perhaps via Experimental Fishing Permits (EFPs), to improve knowledge of HMS fisheries.
- The Center will consider the suggestion to house more CDFW staff at its La Jolla Lab.